North Pacific Fishery Management Council

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MINUTES
Scientific and Statistical Committee
December 7 - 9, 1997

The Scientific and Statistical Committee of the North Pacific Fishery Management Council met December 7-9, 1997 at the Anchorage Hilton Hotel in Anchorage, AK. All members were present with the exception of Marc Miller and Steve Klosiewski:

Keith Criddle, Chair	Jack Tagart, Vice-Chair	Doug Larson
Harold Weeks	Dan Kimura (Alt.)	Doug Eggers
Sue Hills	Richard Marasco	Terry Quinn
Al Tyler	Seth Macinko	

D-1 SAFE/ABC SPECIFICATIONS

Introduction

This is the second year under the new ABC and OFL guidelines in Amendment 44 approved by the Council in 1996. As shown in the recent NMFS report "Status of Fisheries in the United States", the NPFMC has more extensive and conservative guidelines than any other Regional Fishery Management Council. The analysts, Plan Teams, and SSC are following these guidelines in their ABC and OFL determinations this year. In a few cases, recommendations are even more conservative than those contained in the guidelines. In particular, Pacific cod, sablefish, and Atka mackerel ABCs are lower than the maximum allowed under the guidelines. The rationale for the downward adjustment (amplified for each species in its own section below) is that the biomass and/or recruitment for the species is declining and there is sufficient uncertainty in the stock assessment that the maximum ABC allowed may not be sustainable. Emerging evidence in stock assessment science suggests that what have traditionally been viewed as conservative harvesting strategies may not actually be, due to failure to account for uncertainty in stock assessments. Thus, there is a need to undertake more formal risk assessments to provide management advice. The Pacific cod assessment shows one such approach. The NMFS Guidelines for revising overfishing definitions to comply with the Magnuson-Stevens Act are also likely to require more formal risk assessment and potentially lower ABC's.

In the next year, the SSC recommends that the Plan Teams and SSC collaborate to establish a general approach for risk assessment and downward adjustment of ABCs. While some of this will occur under the new overfishing analysis, some additional effort may be required. Rather than being prescriptive, the general approach should allow for a variety of methods to be used.

D-1(a, b) BERING SEA/ALEUTIAN ISLANDS

BS/AI - Pollock

Eastern Bering Sea

The SSC received the Plan Team report from Dr. Grant Thompson, public testimony was presented by Ken Stump, Fran Bennis, and Ed Richardson.

The new assessment for EBS walleye pollock contains data from the 1997 combined trawl-hydroacoustic survey as well as updated age composition and catch data. Integration of the information by modeling consists of two traditional cohort analysis models and 6 new models based on a statistical age-structured model (SAM) framework. The SAM framework responds to past SSC concerns about uncertainty in model parameters and provides a more flexible framework for forecasting and model evaluation. Thus, the SSC concurs with the Plan Team that the SAM framework should replace the traditional cohort analysis approach.

Within the SAM framework, two of the six models warrant attention for making an ABC determination. One model assumes that recruitment follows a Ricker spawner-recruit model with stochastic variation as has been done in past assessments (Model 1), while the other assumes constant stochastic variation about a mean value (Model 4). Both models fit the data equally well and provide similar estimates of biomass and other population parameters through 1997. Model 4 provides a lower forecast of 1997 year-class-strength (for age one in 1998) than Model 1, which results in a lower forecast of future biomass. Consequently, the 1998 ABC of 1.1 million mt from Model 4 is lower than the 1.3 million mt from Model 1. There is no information to justify one model over the other.

There are several uncertainties associated with the current assessment: (1) new modeling and recruitment projections; (2) the potential negative effect of Russia's Navarin Basin catches on the EBS stock; (3) the lack of diversity in age composition due to a succession of low recruitments; (4) a downward adjustment from last year to this year in the recruitment estimate of the 1996 year-class; and (5) concentration of pollock harvests in time and space, the latter being in areas associated with declining sea lion populations. Optimistic counter-balance is found in the following information: (1) the 1996 year-class still appears strong despite not being as strong as estimated in last year's assessment; (2) the pollock population in 1997 is still above the estimated level that would produce MSY; (3) past assessments have tended to underestimate recent biomass; and (4) warm winter conditions in the past have often been associated with strong year-classes.

Attempting to balance the uncertainties with positive signals, the SSC agrees with the Plan Team that ABC should be set to 1.1 million mt. This value is based on a conservative projection of future year-class strength and a conservative choice of fishing mortality (based on $F_{40\%}$). The SSC also agrees with the Plan Team's OFL determination of 2.06 million mt.

The western Bering Sea pollock stock is very depressed. This is evidenced by recent low catches of pollock in the western Bering Sea outside of the Navarin Basin. Since the 1995 season, the entire pollock fishery in the Russian zone has occurred in the Navarin Basin. These catches have been increasing and, in 1997, were believed to be in excess of 600 thousand tons. Because there is a high abundance of younger age pollock in surveys of shelf areas contiguous with the Russian zone, the Navarin Basin is believed to be an important rearing area for eastern Bering Sea pollock. In view of the distribution of eastern Bering Sea pollock and the status of western Bering Sea pollock, the current fishery in the Russian portion of the Navarin Basin is thought to be supported by pollock of eastern Bering Sea origin.

The SSC is concerned that the collective removals of Eastern Bering Sea pollock by the U.S. and Russian zone fisheries may not be sustainable. The sustainability of current removals and specific impact of the Russian zone fishery on eastern Bering Sea pollock cannot be fully evaluated because of lack of stock assessment surveys of the Navarin Basin, as well as information on ages and magnitude of removals of pollock in the Russian zone. The SSC notes that the current assessments of eastern Bering Sea pollock are conservative because they do not specifically consider the Russian zone removals or the surveyed abundance of pollock in the Navarin area. However, the current rate of pollock removals in the Russian zone may be disproportionately high relative to pollock abundance, in which case the removals will result in depletion of the stock in the area and reduce future recruitment of pollock to the eastern Bering Sea.

The SSC requests that further improvements be made in this assessment. First, the analysis should include the entire time series of available information. Second, the incorporation of environment into the stock assessment model (Model 5) was based on a complicated submodel of larval dispersal that did not fit the data significantly better. Several other environmental variables are available which have shown relationships to pollock recruitment and these should be investigated. Third, public testimony expressed concern over shifts in the spatial/temporal concentrations of pollock fishing effort during the first quarter of the year in designated critical sea lion habitat areas. The SSC suggests that additional research should be done to evaluate the distribution of fishing effort with respect to the spatial and seasonal shifts in pollock density. This point is further explored in our discussion of Ecosystem Considerations.

Aleutian Islands

In 1996, the Plan Team responded to a request from the SSC by presenting an age-structured assessment of Aleutian Island pollock. In accepting the estimated biomass from this model, the SSC noted the limited description of model structure, inputs and outputs. In September of this year, the SSC requested that a more detailed report be included in the December 1997 SAFE. Subsequently, the stock assessment authors provided additional detail of the AI pollock model. However, in contrast to the 1996 model evaluation, the stock assessment authors now report that model results "... *showed a fair amount of ambiguity.*" Due to a lack of confidence in the reliability of model outcomes, the authors recommend reverting to bottom trawl survey biomass estimates to derive ABC recommendations. The SSC is disappointed in this turn of events. It is our hope that steps can be taken to obtain the information needed to evaluate AI stock abundance using age-structured models. Nevertheless, the SSC concurs with the Plan Team and stock authors decision to set AI pollock ABC based on bottom trawl survey biomass estimates.

The bottom trawl survey estimates of stock abundance are reported for two distinct regions of the Aleutian Island chain: one from 165°W to 170°W (Unalaska-Umnak area) and the other from 170°W to 170°E (Aleutian Region). Reports indicate that stock found in the Unalaska-Umnak area may be part of the EBS stock, and at any rate are likely to represent biomass already accounted for in the estimates of EBS pollock abundance. Therefore, ABC recommendations depend on bottom trawl biomass estimates from the Aleutian Region only. ABC is recommended to be 23,800 mt (0.75* M * B_{97} or 106,000 * 0.3 * 0.75), the OFL is estimated to be 31,700 mt (M * B_{97}). The SSC recommends that this ABC be partitioned among the western, central and eastern management areas of the Aleutian Region in order to mitigate potential impacts to marine mammals. The resultant division of the ABC using a rounded estimate based on a 20:44:36 split, is 4,700:10,500:8,600 mt for the western, central and eastern AI management zones respectively.

Bogoslof

The SSC supports the Plan Team's ABC (6,410 mt) for Bogoslof Pollock. The 1998 biomass was projected using a natural mortality rate of 0.2 applied to current year biomass (324,000 mt) based on the Bogoslof area hydroacoustic survey. Since estimates of B (current biomass), $B_{0.40}$(2,000,000 mt), $F_{0.40}$(0.27) and $F_{0.30}$ (0.37)

exist and $\alpha < B/B_{0.40} < 1$, F_{ABC} was computed under tier 3b. The projected harvesting under the F_{ABC} (0.026) fishing mortality gives the 1998 ABC of 6,400 mt. F_{OFL} was computed under tier 3b to be 0.035 and translated to exploitation rate and applied to 1998 biomass to give 1998 OFL of 8,750 tons.

BS/AI - Pacific Cod

Dr. Grant Thompson presented the Plan Team's report to the SSC. The SSC heard public testimony on the anticipated impacts of a reduced ABC from Thorn Smith, Janet Smoker, Mike Szymanski, and Brent Paine. Additional public comment on ecosystem considerations associated with the Pacific cod fishery were provided by Ken Stump.

The SSC evaluated proposals for ABCs derived from the base case stock assessment model, and variants of the base case model. The SSC also considered estimates based on trawl survey biomass and a 30% exploitation rate. Following extensive debate, the SSC concurred with the Plan Team's recommended ABC of 210,000 mt derived from the base case model and taking into consideration risk-averse harvest strategies.

The Pacific cod stock assessment represents an application of a model introduced to us in 1996. The model is configured around a base case that uses fixed parameter values for natural mortality (M=0.37) and trawl survey catchability (Q=1.0). From the past assessment, the SSC is aware that model outcomes are sensitive to these values. The specified values were drawn from previous sensitivity analysis. Nevertheless, the SSC remains concerned about the uncertainty associated with the choice of M and Q. The stock assessment authors undertook extensive, technically challenging, analyses to statistically evaluate the effects of altering the parameter values. To do so, the authors begin with a 'reasonable' range of values for M and Q, based on literature reports, past modeling experience and logic. They evaluated the model's fit, through the model likelihood, by systematically, substituting a range of paired values into the model. From this substitution, the authors derived refined probability based parameter values. They then computed a geometric average of the yield associated with the refined parameters. This process produces an integrated estimate of yield under a wide range of probable parameter values, thus incorporating a sense of the uncertainty associated with these quantities.

The SSC had extensive discussions on the methodology employed in the sensitivity analysis and on the author's specification of the initial parameter space. The SSC explored the reasonableness of the specified initial conditions, sensitivity of the model to alternative initial conditions, and the believability of the refined parameter space. Although committee members expressed concerns about the modeling process, the SSC eventually accepted to the analyst's judgement and the sensitivity analysis as it was undertaken.

Stock condition for Pacific cod has been and continues to be in a state of decline. Even under the base case scenario, the stock is expected to continue this decline over the next 5 years. The projected stock decline is responsible for about half the reduction in ABC, the remainder can be attributed to the lower recommended fishing mortality rate derived from the sensitivity analysis of M and Q. Three of the last four year-classes are estimated to be below average. Given the general trend in stock abundance and the sensitivity analysis of uncertainty in parameter values, the SSC believes there is sufficient grounds to accept the Plan Team's recommended ABC.

The SSC commends the stock assessment authors for their development of risk adverse advice in the face of parameter uncertainty. The SSC encourage continued research and refinement of model processes and evaluation of parameter uncertainty.

BS/AI - GOA (combined) - Sablefish

Dr. Mike Sigler (NMFS-Auke Bay) presented the sablefish stock assessment results. This species continues its downward trend as the strong age classes of the late 1970s and early 1980s exit the population. Spawning biomass is currently at about 34% of the unfished level, and assuming a continuation of recent low recruitment patterns, is projected to reach a short term equilibrium at roughly 30% of the unfished level. The 1995 year-class may be much stronger than average, but this group of fish has been observed only once and is only partially recruited to the survey.

The SSC support the Plan Team's and assessment authors' recommendation for a combined ABC of 16,800 mt. This is based on a linear interpolation from last year's ABC to the projected short-term equilibrium yield (F=0.085). Overfishing levels are based on an adjusted $F_{30\%}$ value (= 0.145) prescribed under Tier 3. ABC and OFL levels are distributed among management areas based on exponentially weighted moving average of biomass distribution:

	Average Biomass (%)	ABC (mt)	OFL (mt)
Gulf of Alaska	84.06%	14,120	23,454
Eastern Bering Sea	7.73%	1,300	2,158
Aleutian Islands	8.20%	1,380	2,288
TOTAL	100%	16,800	27,900

The same averaging procedure has been used by the Council to apportion ABC within the Gulf of Alaska. Applying these percentages to the Gulf of Alaska ABC results in the following distribution:

	GOA Biomass (%)	Presumed TAC (mt)
Western Gulf	13.01	1,837
Central Gulf	44.79	6,324
West Yakutat	16.21	2,289
East Yakutat/SE Outside	25.99	3,670
TOTAL	100.00%	14,120

BS/AI - Flatfish

Yellowfin sole

The SSC supports the Plan Team's ABC (220,000 mt) recommendation for this species. Stock synthesis was used to estimate exploitable biomass (1,961,500 mt) that was determined by applying age-specific fishery selectivity to the total biomass estimate (the age 2+ biomass equals 3,010,000 mt). If equilibrium recruitment can be approximated by the average of the time-series reported in this year's assessment, $B_{0.40}$ (equilibrium female spawning biomass resulting from $F_{0.40}$ harvest rate) is 593,000 mt. Since estimates of B (current female spawning biomass), $B_{0.40}$, $F_{0.40}$ and $F_{0.30}$ exist and $B > B_{0.40}$ (756,500 t >593,000 mt) the reference fishing mortality corresponds with tier 3a. For 1998 $F_{ABC} < F_{0.40}$=0.11 and $F_{OFL} = F_{0.30}$ = 0.16. OFL = 314,000 mt.

Greenland turbot

The SSC supports the Plan Team's ABC (15,000 mt) recommendation for this species. The ABC recommendation is based on an estimated 1998 age 1+ biomass of 164,000 mt. This estimate was obtained from an analysis that assumed dome-shaped selectivity for each fishery and survey and constant natural mortality rate, M = 0.18. Model results indicated that the best fit to the data was obtained when the slope survey abundance index represented about 5% of the biomass available to the survey. This value of '*Q*' or catchability is

unreasonably low compared to values common for other flatfish species. Consequently, model fit was investigated for three fixed values of slope survey 'Q': 0.25, 0.50 and 0.75. The most conservative biomass estimate was derived with Q=0.75. Because of the persistent low recruitment in recent years, the authors chose this more conservative model to estimate ABC. Last year, the SSC determined that reliable $B_{0.40}$, $F_{0.40}$, and $F_{0.30}$ estimates existed for this species. Therefore, this species qualified for management under tier 3. Updated estimates of these reference parameters from this year's assessment are 138,000 mt, 0.26 and 0.40, respectively. The projected spawning biomass for 1998 is 95,000 mt placing this species in sub-tier 'b' of tier 3. Adjusted values of $F_{0.40}$ and $F_{0.30}$ are 0.17 and 0.27, respectively. OFL is 22,300 mt.

Arrowtooth flounder

The SSC supports the Plan Team's ABC (147,000 mt) recommendation for this species. Stock synthesis was used to estimate exploitable biomass (639,400 mt) that was determined by applying age-specific fishery selectivity to the total biomass estimate (the age 1+ biomass equals 869,000 mt). Assuming equilibrium recruitment can be approximated by the average of the time-series reported in this year's assessment, $B_{0.40}$ (equilibrium female spawning biomass resulting from $F_{0.40}$ harvest rate) was estimated to be 43,600 mt. This value appears to be low for this species, and the SSC recommends that the team review the estimation of this value. Despite the apparent error in the $B_{0.40}$ estimate, the SSC and Plan Team are confident that current spawner biomass exceeds the appropriately estimated $B_{0.40}$. Since estimates of B (current female spawning biomass), $B_{0.40}$, $F_{0.40}$, and $F_{0.30}$ exist and $B > B_{0.40}$ (531,400>43,600 mt) the reference fishing mortality corresponds with tier 3a. For 1998 $F_{ABC} < F_{0.40}$=0.23 and $F_{OFL} = F_{0.30}$ = 0.36. OFL = 230,000 mt. It is noted that this year's assessment increased the emphasis on fitting the time series of biomass estimates from the EBS bottom trawl survey. This change increased model biomass estimates.

Rocksole

The SSC supports the Plan Team's ABC (312,000 mt) recommendation for this species. The EBS 1997 bottom trawl survey resulted in a biomass estimate of 2,710,000 mt, a 24% increase relative to last year's estimate. The Aleutian Island bottom survey from 1997 resulted in a biomass estimate of 56,200 mt, 31% larger than the 1994 estimate. Stock synthesis was used to estimate exploitable biomass (1,894,500 mt) that was determined by applying age-specific fishery selectivity to the total biomass estimate (the age 2+ biomass = 2,360,000 mt). Assuming equilibrium recruitment can be approximated by the average of the time-series reported in this year's assessment, $B_{0.40}$ (equilibrium female spawning biomass resulting from $F_{0.40}$ harvest rate) is 267,000 mt. Since estimates of B, $B_{0.40}$, $F_{0.40}$, and $F_{0.30}$ exist and $B > B_{0.40}$ (650,000 mt > 267,000 mt) the reference fishing mortality corresponds with tier 3a. For 1998 $F_{ABC} < F_{0.40}$=0.16 and $F_{OFL} = F_{0.30}$ = 0.23. OFL = 449,000 mt.

Flathead sole

The SSC supports the Plan Team's ABC (132,000 mt) recommendation for this species. The EBS 1997 bottom trawl survey resulted in a biomass estimate of 808, 000 mt, a 31% increase relative to last years estimate. The Aleutian Island bottom survey from 1997 resulted in a biomass estimate of 16,200 mt, 5% larger than the 1994 estimate. It is recommended that $F_{ABC} = F_{0.40}$ = 0.16 be used to determine the 1998 ABC. OFL (190,000 mt) is determined by applying $F_{0.30}$ = 0.23.

Other flatfish complex

The SSC supports the Plan Team's ABC (164,000 mt) recommendation for these species. Within this complex, sufficient data were only available to construct an age-structured analysis for Alaska plaice. Bering Sea and Aleutian Islands trawl survey biomass estimates were used to determine the ABC for other species in

this complex (Dover sole, rex sole, starry flounder, English sole, longhead dab, and butter sole). The 1998 stock synthesis estimate of exploitable biomass for Alaska plaice is 522,000 mt. The 1997 survey based exploitable biomass for other species in this complex is 79,800 mt. The Plan Team determined the 1998 age 1+ biomass for this complex to be 789,000 mt. It is noted that the bottom trawl survey estimates for both Alaska plaice and other species in this complex were up over 1996 values, 22% and 17% respectively. Assuming equilibrium recruitment can be approximated by the average of the time-series produced by the stock synthesis analysis, $B_{0.40}$ is estimated to be 112,000 mt for Alaska plaice. The corresponding estimate of the 1998 spawning biomass is 232,700 mt. Since estimates of B, $B_{0.40}$, $F_{0.40}$, and $F_{0.30}$ exist and $B > B_{0.40}$ (233,000 mt > 112,000 mt) the reference fishing mortality for this species corresponds with tier 3a. For 1998 $F_{ABC} < F_{0.40} = 0.29$ and $F_{OFL} = F_{0.30} = 0.45$. Alaska plaice ABC and OFL are 151,000 mt and 235,000 mt, respectively. The ABC and OFL for the remaining species in this complex were determined by applying the $F_{0.40}$ and $F_{0.30}$ for flathead sole, 0.16 and 0.23, respectively to 79,800 mt. Values for these two reference points are 12, 770 mt and 18,350 mt, respectively.

BS/AI - Pacific ocean perch (POP) complex

True POP, Eastern Bering Sea. The SSC supports the Plan Team's ABC (1,400 mt) for this species. A stock synthesis model with decreased emphasis on fitting the biomass estimated from the EBS trawl survey and increased emphasis on fitting the fishery size composition was used to estimate 1998 spawning biomass (23,900 mt). Since estimates of B (current spawner biomass), $B_{0.44}$, $F_{0.44}$, and $F_{0.30}$ exist and / $B_{0.44} < 1$, F_{ABC} was computed under tier 3b. The projected harvesting under the F_{ABC} (0.031) fishing mortality gives the 1998 ABC of 1,400 mt. F_{OFL} was computed under tier 3b to be 0.056. The 1998 OFL of 3, 300 mt does not correspond exactly to a fishing mortality rate of 0.056 but was developed in an analogous fashion.

True POP, Aleutian Islands. The SSC supports the Plan Team's ABC (1,400 mt) for this species. Stock synthesis was used to estimate 1998 spawning biomass (129,900 mt). Since estimates of B (current spawner biomass), $B_{0.44}$, $F_{0.44}$, and $F_{0.30}$ exist and / $B_{0.44} < 1$, F_{ABC} was computed under tier 3b. The projected harvesting under the F_{ABC} (0.055) fishing mortality gives the 1998 ABC of 12,100 mt. F_{OFL} was computed under tier 3a using an F0.30 of 0.096. The 1998 OFL was 20,700 mt. The ABC was apportioned among AI subareas based on survey distribution as follows: Western AI = 5,580 mt, Central AI = 3,450 mt, and Eastern AI = 3,070 mt.

The SSC notes that the Team used the more conservative $F_{0.44}$ criterion when specifying ABC's and OFL's for BSAI POP. The SSC notes that $F_{0.44}$ was selected based on prior GOA analysis. Given revisions to the GOA assessment, the authors should review whether this value remains appropriate for BSAI stock.

BS/AI - Other Rockfish

The SSC supports the Plan Team's ABC for the following groups. ABCs were calculated under Tier 5 using 75% of natural mortality applied to averaged biomass estimates. OFLs were calculated applying natural mortality to average biomass.

Species Group	M	Biomass	ABC	OFL
Aleutians				
Northern/Sharpchin	0.06	94,0000 t	4,230	640
Shortraker/Rougheye	0.030/0.025	24,900 t/21,600 t	965	1,290
Other rockfish	0.07	13,000 t	685	913
Eastern Bering Sea				
Other red rockfish	0.06/0.030/0.035	693 t/8,230 t/2,710 t	267	356
Other rockfish	0.07	7,030 t	369	492

Surveys of rockfish in the Eastern Bering Sea have been sporadic, involved different survey vessels, and survey areas have been inconsistent. EBS slope trawl surveys have not been conducted since 1991, and portions of the EBS portion of the Aleutian Islands survey have been used to provide indices of biomass for recent years. There is considerable uncertainty in the survey estimates of biomass for rockfish in the EBS area. To compensate for incomplete surveys, the Plan Team reconstructed biomass for missing survey years and used average biomass estimates in lieu of recent year surveys.

The SSC notes that ABC and OFL for EBS other red rockfish are substantially lower than last year. This resulted from exclusion of an outlying data point (i.e., the 1986 biomass for EBS northern rockfish). There was concern expressed in public testimony that the reduced OFL might constrain other fisheries.

The SSC notes that stock assessment surveys of the Aleutian Islands area have been more consistent in area coverage and methods, and are expected to continue in the future. To address the poor and ongoing erosion of EBS rockfish assessment surveys, the SSC suggests that the Team consider integrating the assessment of EBS and Aleutian Islands rockfish. The SSC believes that in view of the large portion of the stock in the Aleutian Islands area and the similar trend in POP abundance in the two areas, trends in abundance can be more accurately estimated by an integrated assessment. The Team should consider developing an integrated stock synthesis approach for true POP, as well as an assessment approach that emphasizing more recent biomass estimates for other rockfish species. The SSC notes that in an integrated assessment, the relative biomass magnitudes from historical comprehensive surveys could be used to apportion ABC to AI subareas and EBS consistent with the current separate area assessment.

BS/AI - Atka Mackerel

The SSC support the Plan Team's and chapter authors recommendations of an ABC of 64,300 mt and an OFL of 134,000 mt. The SSC also agrees with the Plan Team's apportionment for the AI subareas: Western AI = 27,000 mt, Central AI = 22,400, and Eastern AI = 14,900 mt.

Although $F_{40\%}$ is allowed as the maximum F_{ABC} for Atka mackerel under Tier 3a of Amendment 44, the continued decline of the stock as seen in the 44% decline of the estimated survey biomass between 1994 and 1997, the difficulty in assessing this species, and concerns relative to the effect of local depletion on marine mammals prompted recommendation of a lower ABC. The recommended ABC results in a fishing mortality rate $F_{52\%}$ = 0.23. Short-term projections of spawner biomass at this F remain within 10% of the estimated $B_{40\%}$ spawning biomass.

Ken Stump, Fran Bennis and Dave Fraser gave public testimony. Concerns regarding compression of the fishery in space and time and the resulting localized depletion are treated in the Ecosystem Considerations Section.

The chapter authors presented their arguments for keeping the BS/AI and GOA Atka mackerel assessment separate. Since it appears that the BS/AI and GOA stocks are interrelated, the SSC recommends additional consideration of an integrated assessment.

BS/AI - Squid and Other Species

The SSC concurs with the Plan Team's recommendation for acceptable biological catch and overfishing levels.

	ABC	OFL
Squid	1,970	2,620
Other Species	25,800	134,000

Dick Tremaine (Central Bering Sea Fishermen's Association) provided public testimony requesting efforts be made to obtain biomass and natural mortality estimates for squid to move it out of the Tier 6 category for ABC recommendations. He remarked that CDQ fisheries may be constrained by squid bycatch allocations, even though aggregate fishing mortality was unlikely to exceed ABC.

D-1 (d, e) GULF OF ALASKA

The NMFS proposal to implement the trawl closure for the eastern gulf has resulted in some controversy regarding distribution of ABCs. The SSC has not attempted to set independent ABCs for species harvested in the West Yakutat/East Yakutat/Southeast Outside management areas, with the exception Southeast Outside Shelf Demersal Rockfish. Development of strategies for ABC distribution in the eastern gulf will require further Plan Team deliberations.

GOA - Pollock

The SSC agrees with Plan Team's recommended ABC and OFL with one minor exception. As reported in 1996, the SSC remains unconvinced that the Prince William Sound pollock fishery exploits a resource that is independent of the assessed GOA pollock population. The SSC hopes that a planed age-structured analysis of Eastern gulf pollock stock will shed some light on this issue. The 1998 Guideline Harvest Level for the PWS fishery is 1,800 mt of pollock. The SSC recommends that this quantity be subtracted from the GOA ABC in proportion to the regional ABCs for the Western/Central and Eastern GOA regions.

The Plan Team's recommended ABC was 120,800 mt for the W/C GOA and 11,000 mt for the Eastern GOA for a combined total of 131,800 mt. Subtracting anticipated PWS harvest, the revised GOA ABC would be 130,000 mt, representing 119,150 mt for the W/C GOA and 10,850 mt for the Eastern GOA. The W/C ABC is proportionately split among sub-regions such that 29,790 mt to western GOA area 61, 50,045 mt to central GOA area 62, and 39,315 mt for central GOA area 63. The SSC has no recommendation for splitting the Eastern GOA ABC.

Estimated GOA pollock biomass has increased in recent years based on the strength of the 1994 year-class. This year class is reported to be the strongest year class on record. The 1989 year-class also continues to contribute to the fishery. While estimated stock abundance is increasing, the 1997 Shelikof hydroacoustic survey biomass has declined by 23% compared to 1996. The 1996 bottom trawl survey estimates are relatively unchanged from those reported in 1993. Projected 1998 spawning biomass is 96% of the $B_{40\%}$ target spawning biomass. Recommended ABCs represent anticipated exploitation levels of approximately 10%, which the SSC regards as very conservative.

The SSC heard testimony from Rich Ferrero, the NMFS/MML, regarding a proposal to amend the seasonal apportionment of GOA pollock TACs. The SSC supports this recommendation as a device to mitigate potential fishing induced impacts on the endangered Steller sea lions.

GOA - Pacific Cod

The SSC concurs with the Plan Team's recommended 77,900 mt ABC for GOA Pacific cod. Structurally, the GOA Pacific cod model is essentially identical to the BS/AI model. The SSC concerns with respect to model specifications are discussed under the BS/AI portion of the minutes. The SSC notes that the analysts incorporated catch and biological data from the State of Alaska fisheries in response to previous SSC requests.

GOA - Flatfish

The SSC supports the Plan Team's ABC recommendations for species in this complex. This complex is subdivided into deepwater flatfish, rex sole, shallow water flatfish, and flathead sole. Species in the deepwater complex are Dover sole, Greenland turbot, and deep-sea sole. northern rock sole, southern rock sole, yellowfin sole, starry flounder, butter sole, English sole, Alaska plaice, and sand sole make up the shallow water complex. The 1998 exploitable biomass for each is based on abundance estimates from the 1996 triennial trawl survey except for Greenland turbot and deep-sea sole. Estimates for these latter two species were not developed because none were caught in the survey. Exploitable biomass estimates, ABCs and OFLs are given below:

Fishery	Exploitable biomass	ABC	OFL	Tier
Deepwater flatfish	101, 430 mt	7,170* mt	9, 440 mt	6
Rex sole	72, 330 mt	9,150 mt	11, 920 mt	5
Shallow water	314, 960 mt	43,150 mt	9, 540 mt	4,5,5
Flathead sole	206, 340 mt	26,110 mt	34, 010 mt	5

For Greenland turbot and deep-sea sole ABC = 0.75 average catch.

Corresponding fishing mortalities and OFL rates are:

	Species	F_{ABC}	F_{OFL}
Deepwater	Dover sole	0.075	0.10
Shallow water	Rock sole	0.17	0.25
	Rex sole	0.15	0.20
	Yellowfin sole	0.15	0.20
	Other flatfish	0.15	0.20
Flathead sole		0.15	0.20

It is recommended that the ABCs for each group be apportioned among the three regulatory areas in proportion to biomass distributions associated with the 1996 bottom trawl survey. The SSC concurs with the Team's recommendation that effort be devoted to development of maturity schedules for flatfish species. The SSC also supports the recommendation, that deep-sea sole be included in the deepwater grouping. In previous annual specifications, it was in the shallow water grouping.

Arrowtooth flounder

The SSC supports the Plan Team's ABC and OFL recommendations for this species. A stock synthesis analysis was used to estimate the 1998 age 3+ biomass (2,062,740 mt) for this species. The corresponding $B_{0.40}$ was determined to be 678,000 mt. Since reliable estimates of $B_{0.40}$, $F_{0.40}$, and $F_{0.30}$ are available and the 1998 spawning biomass is projected to be 1,007,000 t, this species was determined to fall into tier 3a. The ABC (208,000 mt) was determine using $F_{0.40} = 0.189$, and OFL (296,000 mt) was estimated using $F_{0.30} = 0.276$. It recommended that the ABC be apportioned among the three management areas in proportion to the 1996 survey: Western (33,010 mt), Central (149,640 mt) and Eastern (25,690 mt).

GOA - Slope Rockfish

Pacific Ocean Perch.

The SSC supports the Plan Team's ABC (12,820 mt) for this species. A new version of the stock synthesis model with better estimation properties was used to estimate 1998 spawning biomass (107,200 mt). However, the transition to the new version of the software produced some unexpected results that will require further

investigation. Since estimates of B (current spawner biomass), $B_{0.40}$, $F_{0.40}$, and $F_{0.30}$ exist and B/ $B_{0.40} < 1$, F_{ABC} was computed under tier 3b. The projected harvesting under the F_{ABC} (0.055) fishing mortality gives the 1998 ABC of 12,820 mt. F_{OFL} was computed under tier 3b to be 0.056. The 1998 OFL under tier 3b was 18,090 mt. Using area apportionments of 14.1%, 51.5%, and 34.4% for the Western, Central, and Eastern areas, results in recommended ABC's of 1,180 mt, 6,600 mt, and 4,410 mt, respectively. Using the same apportionments results in overfishing levels of 2,220 mt, 9,320 mt, and 6,220 mt, respectively.

Shortraker/Rougheye

The SSC supports the Plan Team's ABC (1,590 mt) for this species. As little new survey information is available for this species, the recommended ABCs were set equal to the values adopted by the Council for 1997. Exploitable biomass were the averaged of the three most recent surveys and 16,673 mt for shortraker rockfish and 48,709 mt for rougheye rockfish. Using tier 5 for shortraker rockfish and tier 4 for rougheye results in ABC of 1,590 for the group (370 mt for shortraker and 1,110 for rougheye) and OFL of 2,740 for the group. The ABC should be apportioned 160 mt, 970 mt, and 460 mt to the Western, Central, and Eastern areas.

Northern Rockfish

The SSC supports the Plan Team's ABC (5,000 mt) for this species. As little new survey information is available for this species, the recommended ABCs were set equal to the values adopted by the Council for 1997. The recommended $F_{ABC} = M = 0.06$, is less than that allowed under tier 4. The exploitable biomass is 83,370 mt. Applying the F_{ABC} results in ABC of 5,000 mt. The $F_{0.30}$ rate was applied results in OFL of 9,420 mt. Distributing this ABC based on the same method used for POP results in ABCs of 840 mt for the Western area, 4,150 for the Central area, and 10 mt for the Eastern area.

Other Slope Rockfish

The SSC supports the Plan Team's ABC (5,260 mt) for this species. As little new survey information is available for this species, the recommended ABCs were set equal to the values adopted by the Council for 1997. A tier 4 strategy was used for sharpchin rock fish, and tier 5 strategy for other species within the group. The combined ABC (5,260 mt) was apportioned using the same method used for POP and results in ABCs of 20 mt for Western area, 650 mt for Central area and 4,590 mt for Eastern area. The OFL is 7,560 mt.

Pelagic Shelf Rockfish

The SSC accepts the Plan Team recommendation for ABCs for the Pelagic Shelf Rockfish. The SSC notes that this recommendation is complicated by the pending change in the GOA FMP, which would remove nearshore pelagic rockfish (i.e., black and blue rockfish) from the FMP. Since the proposed amendment has not yet been enacted as a final rule, the Council is obligated to create separate ABCs for nearshore and offshore pelagic rockfish. The nearshore ABC is 260 mt for the Central GOA only. The offshore ABC is 5,000 mt. When the final rule for Amendment 46 has been adopted, the ABC for the offshore component of the Pelagic shelf rockfish should be adjusted to 4,880 mt. ABCs are based on trawl survey biomass under an F=M exploitation strategy. Exploitation rate is 9%. Stock biomass including black and blue rockfishes is 55,580 mt. Stock biomass without black and blue rockfish is 54,222 mt. The overfishing level is based on an $F_{30\%}$ exploitation rate, 15%, resulting in a Gulf-wide OFL of 8,390 mt.

GOA - Demersal Shelf Rockfish

This analysis has been updated in terms of available data and methodology. The SSC supports the analysts' 1998 estimates of ABC = 560 mt and OFL = 950 mt. However, the SSC would like to see more details from the assessment concerning the accuracy of measurement of habitat area, and the quality of estimates from the line transect model (e.g. frequency distributions of observed and predicted perpendicular distances and which sighting model was used). Although the SSC concurs with the conservative approach to estimating biomass, the logic for estimating total biomass as the sum of the 90% lower-bound confidence limits on a district basis should be better explained. Recall that the sum of the 90% lower-bound confidence limits does not represent a 90% lower-bound confidence limits for the population total.

GOA- Thornyhead Rockfish

The SSC notes that improvements to the stock assessment model have been made and agrees with the Plan Team on the recommended ABC of 2,000 mt and OFL of 2,840 mt. The SSC further agrees that the ABC should be allocated to Western, Central and Eastern regions as 250, 710, 1,040 mt, respectively.

The SSC notes that the stock assessment model does not fit the trends in longline and trawl abundance particularly well. There is no evidence of any strong recent recruitment in the data and therefore there is a need for a survey on the slope to provide better abundance information.

GOA - Atka Mackerel

The SSC agrees with the Plan Team's and authors' recommendation that the ABC be set at 600 mt. The only new information presented was updated catch information that allowed reduction of the ABC from last year's 1,000 mt with reasonable assurance that other fisheries will not be constrained. This year's ABC is decreased from last year to insure that no targeting or topping off will occur on this stock. The OFL is 6,200 mt based on the average catch from 1978-1995.

The chapter author presented information supporting the continued separation of the BS/AI and GOA stock. The SSC will continue to discuss the issue.

D-1(e) Halibut Discard Mortality Rates

Gregg Williams (IPHC) briefed the SSC on the revised halibut bycatch discard mortality rates. Gregg also reported on investigations from the flathead sole fishery resulting in different discard mortality rates for catcher vessels as opposed to catcher processors, and an investigation into seasonal differences in discard mortality rates in the deep water flatfish fisheries of the GOA.

The SSC supports continuing efforts to use observer data to further understand those elements of fishing practices that influence halibut discard mortality rates. The SSC recommends that standard errors be reported on the estimates to aid the comparison of estimates over time or among gear types. Some apparent differences may simply be a consequence of sampling variability.

SAFE Ecosystem Chapter

Dave Witherell presented the staff report. This chapter continues to be a dynamic effort to keep the Council and interested public abreast with changing ecological conditions and our understanding human impacts on marine

ecosystems. New sections in the current chapter include an overview of the precautionary approach an update on essential fish habitat, options in Steller sea lion recovery, oceanographic effects on North Pacific groundfish and anecdotal information from the fishing fleet, coastal communities and agencies. Other sections are updates and expansions of sections introduced in earlier versions.

The SSC highlights for the Councils attention several multispecies concerns that lie at the interface of sea lion conservation and fisheries management. Both fishers and sea lions should be viewed as "intelligent" predators that often compete for common prey. Prey availability is increasingly understood to be important to sea lion conservation and recovery. Thus, the magnitude, timing, and location of major fisheries targeting sea lion prey, particularly Atka mackerel and walleye pollock, become a focal concern. Foraging success for sea lions is clearly related to the probability of encounter with prey species, thus localized depletion of common target or forage species is an important issue. Localized depletion has been documented somewhat for Atka mackerel. Often the issue of prey availability results in calls for reduced quotas for forage species. While this is one approach, the SSC notes that temporal or spatial displacement of fisheries that may compete with Steller sea lions during critical times (late lactation and initial pup foraging in late fall and early winter) could have the same effect of improving forage availability. The SSC encourages further exploration of the tradeoffs between adjustment of fisheries removals, timing and location as means to improve sea lion forage availability and/or reduced disturbance.

The SSC also encourages NMFS to renew its efforts to develop an experimental design to evaluate the effectiveness of exclusion zones of various sizes around sea lion rookeries and haulouts. Such an evaluation of trawl exclusion zones would also be very valuable with respect to crab bycatch management measures in Bristol Bay and related benthic habitat impacts.

Other - Plan Team Nominations

The SSC concurs with the appointments of Mr. Al Spalinger to the Bering Sea Crab Plan Team and Mr. Jeff Barnhart to the Scallop Plan Team.

Inshore/Offshore 3 Update:

Staff presentation was made by Chris Oliver and Darrell Brannan. Public testimony was given by John Gauvin (Groundfish Forum), Paul MacGregor and Ed Richardson (At-Sea Processors Association), and Rebecca Baldwin.

The SSC has the following general observations:

1) The analysts should detail the main parameters used in analyses of net benefits and distributional effects. Assumptions and uncertainty about parameter values should be explicitly noted.

2) There is great latitude, generally, in the bases on which Council decisions can be justified and the degree of quantification that is possible and appropriate.

3) Adequate treatment of different sectors is an overriding consideration in constructing the analysis and report.

4) The SSC pointed out a number of areas where the document may be misinterpreted and made suggestions for specific modifications to the analysis.

Specific Observations:

1) There are no good bases or models for quantitatively predicting how patterns of product form, market share, prices, etc. may change. The analysis should consider variability and uncertainty in these parameter estimates.
2) Assuming constant prices and ignoring changes in costs, as in Assumption 5, implies that changes in gross earnings will be directly proportional to the changes in quotas that result from the Council's preferred alternative.

3) Product Recovery Rates are variable due to things such as sampling error in the estimates of total catch. They are also subject to change, as the industry evolves and as the importance of increased utilization is fully appreciated.

4) Changes in consumer's surplus will result partly from supply shifts due to the Council's choice of a preferred allocation. In some markets, consumer's surplus will increase, and in others, it will decrease. It is not possible to net these out without information on the relevant demand and supply elasticities. A qualitative discussion of producer's surplus changes should also be included. However, it may not be possible to reliably predict the direction of net impact.

5) Assumption 15 should be refocused from "entry/exit" and "investment/disinvestment" issues to fishery substitution patterns that may be induced by different allocations, and given a higher priority in the analysis.

6) Exchange rate effects in foreign product markets should be qualitatively discussed.

7) Regional shifts in taxes (landings, sales, corporate, income, etc.) are likely to result from changes in the allocation. These shifts may be difficult to trace, and likely represent second-order impacts.

8) The analysts should be careful to clearly define terms (e.g., what is meant by 'threshold analysis') so that they are understandable to all interested parties.

9) The issue of voluntary industry data submissions may present challenges to the analysts. While the SSC welcomes and encourages industry cooperation, methods and standards for appropriate integration of such data into the analysis are not yet clearly established and will require further consideration by the staff and SSC.